Name: _____

Directions: Show all work. No credit for answers without work.

1. [**2 parts, 2 points each**] Find a the characteristic polynomial and eigenvalues of the matrices below.

   (a) $\begin{bmatrix} 12 & 10 \\ -5 & -3 \end{bmatrix}$

   (b) $\begin{bmatrix} 28 & 0 & 11 \\ 6 & -2 & 3 \\ -66 & 0 & -27 \end{bmatrix}$

2. **[2 points]** Find a basis for the eignespace associated with eigenvalue $\lambda = 2$ for the matrix given below.

$$\begin{bmatrix} -1 & -1 & 1 & -2 \\ 8 & 5 & -2 & 5 \\ -2 & -1 & 2 & -1 \\ 0 & 0 & 0 & 2 \end{bmatrix}$$

3. **[2 points]** Let $f(\lambda)$ be the characteristic polynomial of the $n \times n$ matrix A, and let h be a scalar. Find the characteristic polynomial of the matrix $A + hI$ in terms of f.

4. **[2 points]** Is there an $n \times n$ matrix A such that the eigenspace associated with eigenvalue $\lambda = 3$ is all of $\mathbb{R}^n$? Either give an example or explain why not.